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Regulatory Impact Analysis of the Modernization of Ignitable Liquid Determination Rule

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prepared for:

U.S. Environmental Protection Agency

Office of Resource Conservation and Recovery

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INTRODUCTION

This document presents EPA's analysis of the costs, benefits, and economic impacts of the final rule to update testing methods for determining if a RCRA solid waste exhibits the characteristic of ignitability. Under the final rule, the test methods established to test the ignitability of liquid wastes will offer the option to follow new standards that reflect best practices in sample testing, rather than outdated standards that have become increasingly difficult for laboratories to comply with. The final rule therefore will assist both enforcement agencies and the regulated community in using best practices to identify hazardous wastes.

NEED FOR REGULATION

The two methods established under RCRA to conduct flash point tests of ignitability were adopted by ASTM International in 1978 and 1980 and have since become out of date. This has created numerous problems for entities conducting flash point tests, including:

- **The required use of mercury thermometers**: Under both ASTM D 93-80 and ASTM D 3278-78, the instrumentation used to conduct flash point tests must use mercury-containing thermometers. This requirement conflicts with EPA's ongoing efforts to remove and/or minimize the use of mercury in laboratories.
- **Setaflash check fluid**: The Setaflash Standard requires the use of para-xylene check fluid as a reference material prior to testing a sample, but the manufacturer of para-xylene no longer produces the reference material. The manufacturer sells a similar product that would be an adequate substitute for para-xylene, but it is only available at quantities that would be unsafe for long-term storage and use in laboratories.
- **Pensky-Martens validation**: The Pensky-Martens Standard does not require the use of a certified reference material (CRM) prior to testing a sample, which is inconsistent with industry best practices for quality control in sample analysis.
- **Availability of Setaflash apparatus**: The manufacturer of the Setaflash apparatus no longer produces a version that can ramp the sample's temperature at 0.5°C per minute, as required by the 1978 Setaflash standard. In addition, current Setaflash instruments come with a thermocouple device for measuring the sample temperature, and they do not accommodate the use of a mercury-containing thermometer. It is therefore not possible to obtain a new Setaflash instrument that complies with the 1978 standard.

To resolve these issues, EPA has decided to work with ASTM International to develop two new standards for flash point testing and to update §261.21 to refer to these new standards.

SUMMARY OF THE FINAL RULE AND REGULATORY ALTERNATIVES

The key provisions of the final rule include the following:

- The final rule will update §261.21 to refer to two new standards covering use of Pensky-Martens (1010B) and Setaflash (1020C) test methods. The current methods, 1010A and 1020B, will remain available for any laboratories that wish to use them.
- The new standards will not require the use of mercury-containing thermometers. Instead, the standards will specify the use of either a temperature-measuring device or a liquid-in-glass thermometer with an accuracy of better than 0.5°C up to 70°C.
- The new standards will require the use of certified reference material (CRM) as a check fluid for both Pensky-Martens and Setaflash tests. The Pensky-Martens standard will not specify a specific CRM to be used but will require that the CRM meet ASTM/ISO 17034 and ISO Guide 35 standards.[1] The Setaflash standard will require the use of a CRM that has a flash point that is reasonably close to the expected temperature range of the samples to be tested.
- The new standard for Setaflash tests will require that Method B (Finite Flash Point) be used to test for ignitability, due to the fact that Method A (Flash/No Flash) can result in false positives.
- The new standards will specify faster ramping speeds than 0.5°C per minute. The Pensky-Martens standard will specify a ramp speed of 2.5-3.5°C per minute; the Setaflash standard will specify a ramp speed of 1°C per minute for a manual apparatus and 2°C per minute for an automatic apparatus.
- The final rule will state that the Setaflash method is preferred unless there is a sample-specific reason for using the Pensky-Martens method. For example, because the Pensky-Martens method requires a larger quantity of the sample for the test, it may be preferred for samples that form a film during testing or that contain suspended solids.
- The final rule will also update the following test methods to remove language requiring the use of mercury-containing thermometers:
    - Method 0010 covers the determination of destruction and removal efficiency of semivolatile principal organic hazardous compounds from incineration systems;

[1] ISO 17034 sets requirements for the competence of reference material producers. ISO Guide 35 provides guidance for characterization and assessment of homogeneity and stability of reference materials.

- Method 0011 covers the determination of destruction and removal efficiency of selected aldehyde and ketone emissions from stationary sources;
- Method 0020 covers semiquantitative estimates of the amounts and types of semivolatile organic and particulate materials that are discharged from incineration systems;
- Method 0023A covers the determination of stack emissions of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofuran from stationary sources;
- Method 0051 covers the collection of hydrogen chloride and chlorine in stack gas emission samples from hazardous waste incinerators and municipal waste combustors.

UNIVERSE

The proposed Modernization of Ignitable Liquid Determination Rule to update the test methods for the ignitability characteristic determination may potentially affect any laboratory that currently conducts flash point tests using either Method 1010A (Pensky-Martens) or Method 1020B (Setaflash). The rule may also affect any laboratory that conducts tests using any of the methods updated to remove references to mercury thermometers (Method 0010, Method 0011, Method 0020, Method 0023A, or Method 0051). The analysis of the rule's cost and cost savings impacts estimates incremental costs that will be incurred on a per-facility basis (e.g., training) as well as incremental costs and cost savings that will be incurred on a per-test basis (e.g. labor time to conduct tests). To facilitate the estimation of all such costs and cost savings associated with the final rule, this RIA estimates the number of facilities affected by the final rule and the number of liquid flash tests conducted annually across the universe of facilities.

The universe of facilities affected by the proposed updates to ignitability test methods and test methods removing the requirement for mercury thermometers includes (1) commercial laboratories, (2) regional EPA laboratories, and (3) state laboratories. To estimate the number of such laboratories, this RIA uses a combination of data from laboratory accreditation organizations and correspondence with the personnel of commercial, EPA, and state laboratories.

This RIA uses two approaches to estimate the number of flash point tests performed annually using either Method 1010A or Method 1020B. Both approaches account for the two groups of laboratories which conduct ignitability testing: government labs and commercial labs. Both methods also account for two main sources of ignitability testing: (1) tests conducted on behalf of hazardous waste generators to characterize new potentially ignitable waste streams and (2) tests ordered by government enforcement or compliance staff.

Exhibit ES-1 summarizes the estimated number of laboratories affected by the proposed changes to the ignitability test, as well as the number of ignitability tests conducted by these laboratories each year. Both the number of laboratories and the number of annual tests are presented by test method. To estimate the number of annual tests conducted by test method, EPA assumes that the distribution of tests by method for each laboratory type is proportional to the distribution of laboratories by method.

As shown in Exhibit ES-1, EPA identified 217 unique commercial laboratories that conduct ignitability testing under either Method 1010 or 1020. EPA identified an additional 18 laboratories accredited to conduct any of the five additional test methods that remove language referencing mercury thermometers under the final rule, for a total of 235 commercial labs affected by the rule.

EXHIBIT ES-1. SUMMARY OF LABORATORY AND ANNUAL TEST ESTIMATES USED IN THIS RIA, BY TEST METHOD

LABORATORY TYPE	NUMBER OF LABORATORIES			NUMBER OF ANNUAL TESTS					
				LOW ESTIMATE			HIGH ESTIMATE		
	1010A	1020B	TOTAL	1010A	1020B	TOTAL	1010A	1020B	TOTAL
Commercial	198	19	217	4,132	396	4,528	26,771	2,569	29,340
EPA	2	7	9	19	69	88	98	361	460
State	4	16	20	29	105	133	202	742	945
Total	204	42	246	4,180	570	4,750	27,071	3,672	30,744

Note:
Method 1010A is the current Pensky-Martens test method, and Method 1020B is the current Setaflash test method.

METHODOLOGY AND RESULTS

This RIA estimates the cost savings of the final rule as the difference between affected facilities' baseline and policy-case (i.e., with the final rule) costs associated with ignitability testing and maintenance of mercury-containing thermometers. This is consistent with guidance included in EPA's Guidelines for Performing Economic Analyses and OMB Circular A-4.[2] In general terms, EPA's methodology consists of three steps. First, EPA estimated the costs of conducting flash point tests for facilities in the potentially regulated universe in the baseline (no rule) scenario. Next, the Agency estimated the costs to facilities in the potentially regulated universe in the final rule scenario. Finally, EPA estimated the costs and cost savings of the final rule by comparing the estimated costs of conducting ignitability tests under the baseline and final rule scenarios.

To estimate costs in the baseline and proposed-rule scenarios, EPA estimated two broad categories of costs:

- Per-facility costs are costs that are incurred for each facility potentially affected by the final rule. They include one-time costs (e.g., costs of purchasing a new

[2] U.S. EPA, *Guidelines for Preparing Economic Analyses*, December 2010; Office of Management and Budget, Circular A-4, September 17, 2003.

apparatus and training staff in its use), as well as ongoing costs (e.g., costs of calibrating mercury-containing thermometers).

- Per-test costs are costs that are incurred for each ignitability test conducted by a facility potentially affected by the final rule. They include costs associated with labor, solvent for cleaning the flash point test apparatus, and certified reference material.

When estimating the cost impacts of the final rule, this RIA makes the following assumptions:

- All laboratories will adopt the new test methods for whatever test method they are currently using. Those laboratories that currently use Method 1010A (Pensky-Martens) will adopt Method 1010B, and those that currently use Method 1020B (Setaflash) will adopt Method 1020C.
- All laboratories that adopt one of the new test methods will use an automated instrument. EPA Regional and State laboratories that do not already have automated test instruments (either Pensky-Martens or Setaflash instruments) would purchase new instruments. Commercial laboratories are assumed to already have automated test instruments for use under non-EPA test methods.
- All automated test instruments come with a non-mercury thermometer or thermocouple. In addition, as noted above, EPA assumes that all laboratories opting to switch to the updated ignitability tests either have an automated test instrument already (in the case of commercial laboratories and some State and EPA laboratories) or will obtain an automated test instrument equipped with a non-mercury thermometer. Therefore, the only laboratories that would need to purchase a non-mercury thermometer are the 18 commercial laboratories that are accredited to conduct the five additional test methods for which the final rule will remove language requiring mercury thermometers.
- Only laboratories that purchase a non-mercury thermometer (i.e., the 18 commercial laboratories mentioned above) would incur costs to have those thermometers calibrated.

Exhibits ES-2, ES-3, and ES-4 summarize the total net present value of cost impacts of the final rule by laboratory type for the final rule scenario, using three percent and seven percent discount rates. Exhibit ES-2 presents total estimated cost impacts associated with changes to ignitability test methods; Exhibit ES-3 presents total estimated cost impacts associated with changes to test methods containing language that references mercury-containing thermometers; and Exhibit ES-4 presents total estimated cost impacts for all changes. Exhibits ES-5, ES-6, and ES-7 present *annualized* cost impacts by laboratory type for the changes to ignitability test methods, changes to test methods with language referencing mercury-containing thermometers, and both changes combined, respectively.

EXHIBIT ES-2. NET PRESENT VALUE COST IMPACTS OF THE PROPOSED CHANGES TO IGNITABILITY TEST METHODS OVER 20 YEARS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($7,080,000) - ($1,500,000)	($4,860,000) – ($890,000)
EPA	($116,000) – ($4,460)	($63,200) - $16,100
State	($235,000) - $8,410	($124,000) - $48,900
Total	($7,430,000) – ($1,490,000)	($5,050,000) - ($825,000)

EXHIBIT ES-3. NET PRESENT VALUE COST IMPACTS OF THE PROPOSED CHANGES TO MERCURY THERMOMETER TEST METHODS OVER 20 YEARS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($15,700)	($6,920)
EPA	$0	$0
State	$0	$0
Total	($15,700)	($6,920)

EXHIBIT ES-4. NET PRESENT VALUE COST IMPACTS OF THE PROPOSED RULE OVER 20 YEARS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($7,100,000) - ($1,510,000)	($4,870,000) – ($897,000)
EPA	($116,000) – ($4,460)	($63,200) - $16,100
State	($235,000) - $8,410	($124,000) - $48,900
Total	($7,450,000) – ($1,510,000)	($5,060,000) - ($832,000)

EXHIBIT ES-5. ANNUALIZED COST IMPACTS OF THE PROPOSED CHANGES TO IGNITABILITY TEST METHODS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($476,000) - ($101,000)	($459,000) – ($84,000)
EPA	($7,790) – ($300)	($5,970) - $1,520
State	($15,800) - $565	($11,700) - $4,620
Total	($499,000) – ($100,000)	($477,000) - ($77,800)

EXHIBIT ES-6. ANNUALIZED COST IMPACTS OF THE PROPOSED CHANGES TO MERCURY THERMOMETER TEST METHODS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($1,060)	($653)
EPA	$0	$0
State	$0	$0
Total	($1,060)	($653)

EXHIBIT ES-7. ANNUALIZED COST IMPACTS OF THE PROPOSED RULE (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($477,000) - ($102,000)	($460,000) – ($84,600)
EPA	($7,790) – ($300)	($5,970) - $1,520
State	($15,800) - $565	($11,700) - $4,620
Total	($500,000) – ($101,000)	($477,000) - ($78,500)

EQUITY CONSIDERATIONS AND OTHER IMPACTS

As required by applicable statutes and executive orders, this RIA examines equity considerations and other regulatory concerns associated with the final rule. Specifically, this RIA considers the following:

- **Regulatory planning and review**: This action is not a "significant regulatory action" in that it is not expected to have an annual effect on the economy of $100 million or more, and it does not raise novel legal or policy issues.
- **Regulatory flexibility:** Because the final rule is expected to result in net cost savings, EPA estimates that the final rule will not have significant economic impacts on a substantial number of small entities under the Regulatory Flexibility Act.
- **Employment impacts:** EPA estimates that the final rule will have minor impacts on employment, with potential increases in one-time labor needs (e.g., for Demonstration of Capabilities for a new apparatus) and potential decreases in annual labor needs (for the time needed to conduct ignitability tests).
- **Unfunded mandates:** Because the final rule is expected to lead to net cost savings, EPA expects that it would not result in annual expenditures exceeding $100 million annually and therefore would not be subject to requirements of Section 202 of the Unfunded Mandates Reform Act (UMRA).
- **Federalism:** EPA estimates that the final rule will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various

levels of government, though it may result in a combination of costs and cost savings for individual states. States with laboratories that conduct ignitability testing may adopt one of the new test methods. If they do so, they will likely incur one-time costs to purchase automated test instruments, conduct a Demonstration of Capability, and train staff in following the new test method, though this RIA estimates that they will also realize cost savings from reduced time to conduct tests, and potentially reduced costs for Certified Reference Material.

- **Tribal governments:** Because the final rule is expected to result in net cost savings, EPA does not expect that it would result in any adverse impacts on tribal entities.
- **Energy Impacts:** The Final Rule does not directly regulate energy production or consumption. In addition, with net annual cost savings, the costs of this final rule are not considered economically significant.
- **Environmental justice:** Because the final rule would only change test methods for characterizing hazardous waste, it would not affect how such waste is disposed of. EPA therefore does not expect it to result in any adverse environmental justice impacts.
- **Children's health protection:** Because the final rule is not expected to have a significant economic impact, it is not subject to Executive Order 13045, which requires EPA to evaluate the environmental health or safety effects of rules on children.
- **Reducing regulations and controlling regulatory costs:** Executive Order 13771 requires an accounting of the net costs or cost reductions of a rulemaking. The annualized net cost impacts of the final rule are net cost savings of between $78,500 and $477,000 (based on a discount rate of 7 percent).

CHAPTER 1. INTRODUCTION

This document presents EPA's analysis of the costs, benefits, and economic impacts of the final rule to update testing methods for determining if a RCRA solid waste exhibits the characteristic of ignitability. Under the final rule, the test methods established to test the ignitability of liquid wastes will offer the option to follow new standards that reflect best practices in sample testing, rather than outdated standards that have become increasingly difficult for laboratories to comply with. The final rule therefore will assist both enforcement agencies and the regulated community in using best practices to identify hazardous wastes.

BACKGROUND

Under RCRA, generators of waste are responsible for determining whether that waste is hazardous, either themselves or by hiring another entity – such as a commercial laboratory – to make that determination for them. In addition, enforcement agencies, such as EPA Regional offices and State agencies with delegated RCRA authority, may need to identify hazardous wastes as part of enforcement activities, to determine whether waste generators have identified hazardous waste appropriately, or to identify hazardous wastes at sites with improper waste storage or disposal.

Under RCRA, wastes can be classified as hazardous in two ways:

- A waste exhibits certain hazardous properties ("characteristics"), or
- A waste is included on a specific list of wastes EPA has determined are hazardous.

The four characteristics that can categorize a waste as hazardous are ignitability, corrosivity, reactivity, and toxicity. Ignitable wastes pose a hazard because they can lead to fires under certain conditions. The criteria used to determine if a waste exhibits the ignitability characteristic are defined in 40 CFR §261.21. For liquid wastes, §261.21 establishes two "flash point" test methods that can be used to determine whether the waste exhibits the ignitability characteristic:

- The Pensky-Martens Closed-Cup Method for Determining Ignitability (Method 1010A), and
- The Setaflash Closed-Cup Method for Determining Ignitability (Method 1020B).

Under both of these methods, a sample of the waste is placed in an apparatus that gradually increases (or "ramps") the temperature of the sample and applies a spark to the sample at specified intervals. The temperature at which the sample "flashes" or ignites in response to the spark is the flash point of the sample. Liquids with a flash point less than 60°C are defined to exhibit the ignitability characteristic.

When these methods were established, they referred to two standards adopted by the American Society for Testing Materials (since renamed ASTM International):

- ASTM D 93-80: Flash Point By Pensky-Martens Closed Tester, adopted in 1980, and
- ASTM D 3278-78: Flash Point of Liquids By Setaflash Closed Tester, adopted in 1978.

ASTM International has revised these standards multiple times since adopting them in 1980 and 1978, respectively, but §261.21 still refers to the older standards. In order to allow those conducting ignitability tests to follow best practices in ignitability test methods, EPA is proposing this rule to update test methods for determining the ignitability characteristic for hazardous waste. In addition, EPA is proposing to update several additional test methods to remove language that currently requires the use of mercury-containing thermometers, in order to allow laboratories that conduct EPA method tests to reduce the use of instruments that contain mercury.

NEED FOR REGULATION

As noted above, the two methods established under RCRA to conduct flash point tests of ignitability were adopted by ASTM International in 1978 and 1980 and have since become out of date. This has created numerous problems for entities conducting flash point tests, including:

- **The required use of mercury thermometers**: Under both ASTM D 93-80 and ASTM D 3278-78, the instrumentation used to conduct flash point tests must use mercury-containing thermometers. This requirement conflicts with EPA's ongoing efforts to remove and/or minimize the use of mercury in laboratories.
- **Setaflash check fluid**: The Setaflash Standard requires the use of para-xylene check fluid as a reference material prior to testing a sample, but the manufacturer of para-xylene no longer produces the reference material. The manufacturer sells a similar product that would be an adequate substitute for para-xylene, but it is only available at quantities that would be unsafe for long-term storage and use in laboratories.
- **Penky-Martens validation**: The Pensky-Martens Standard does not require the use of a certified reference material (CRM) prior to testing a sample, which is inconsistent with industry best practices for quality control in sample analysis.
- **Availability of Setaflash apparatus**: The manufacturer of the Setaflash apparatus no longer produces a version that can ramp the sample's temperature at 0.5°C per minute, as required by the 1978 Setaflash standard. In addition, current Setaflash instruments come with a thermocouple device for measuring the sample temperature, and they do not accommodate the use of a mercury-containing

thermometer. It is therefore not possible to obtain a new Setaflash instrument that complies with the 1978 standard.

To resolve these issues, EPA has decided to work with ASTM International to develop two new standards for flash point testing and to update §261.21 to refer to these new standards.

SUMMARY OF THE FINAL RULE AND REGULATORY ALTERNATIVES

The key provisions of the final rule include the following:

- The final rule will update §261.21 to refer to two new standards covering use of Pensky-Martens (1010B) and Setaflash (1020C) test methods. The current methods, 1010A and 1020B, will remain available for any laboratories that wish to use them.
- The new standards will not require the use of mercury-containing thermometers. Instead, the standards will specify the use of either a temperature-measuring device or a liquid-in-glass thermometer with an accuracy of better than 0.5°C up to 70°C.
- The new standards will require the use of certified reference material (CRM) as a check fluid for both Pensky-Martens and Setaflash tests. The Pensky-Martens standard will not specify a specific CRM to be used but will require that the CRM meet ASTM/ISO 17034 and ISO Guide 35 standards.[3] The Setaflash standard will require the use of a CRM that has a flash point that is reasonably close to the expected temperature range of the samples to be tested.
- The new standard for Setaflash tests will require that Method B (Finite Flash Point) be used to test for ignitability, due to the fact that Method A (Flash/No Flash) can result in false positives.
- The new standards will specify faster ramping speeds than 0.5°C per minute. The Pensky-Martens standard will specify a ramp speed of 2.5-3.5°C per minute; the Setaflash standard will specify a ramp speed of 1°C per minute for a manual apparatus and 2°C per minute for an automatic apparatus.
- The final rule will state that the Setaflash method is preferred unless there is a sample-specific reason for using the Pensky-Martens method. For example, because the Pensky-Martens method requires a larger quantity of the sample for the test, it may be preferred for samples that form a film during testing or that contain suspended solids.
- The final rule will also update the following test methods to remove language requiring the use of mercury-containing thermometers:

[3] ISO 17034 sets requirements for the competence of reference material producers. ISO Guide 35 provides guidance for characterization and assessment of homogeneity and stability of reference materials.

- Method 0010 covers the determination of destruction and removal efficiency of semivolatile principal organic hazardous compounds from incineration systems;
- Method 0011 covers the determination of destruction and removal efficiency of selected aldehyde and ketone emissions from stationary sources;
- Method 0020 covers semiquantitative estimates of the amounts and types of semivolatile organic and particulate materials that are discharged from incineration systems;
- Method 0023A covers the determination of stack emissions of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofuran from stationary sources;
- Method 0051 covers the collection of hydrogen chloride and chlorine in stack gas emission samples from hazardous waste incinerators and municipal waste combustors.

REPORT ORGANIZATION

EPA has prepared this RIA consistent with the requirements of Executive Order 12866, as amended by Executive Order 13563, and OMB Circular A-4.[4] The assessment of the rule's costs, benefits, and other economic impacts is presented in subsequent sections as follows:

- ***Characterization of the Universe of Potentially Affected Facilities:*** To provide context for the assessment of costs and benefits, this section characterizes the universe of facilities likely to be affected by the rule and presents estimates of the annual number of flash point tests conducted by different categories of facilities.
- ***Methodology and Results:*** This section explains the methods employed by EPA for assessment of the final rule's anticipated costs and benefits and presents EPA's estimates of these impacts.
- ***Equity Considerations and Other Impacts:*** The RIA concludes by assessing distributional and other impacts of the final rule, including small entity impacts, environmental justice implications, children's health, impacts to Tribal Governments, assessment of the potential for unfunded mandates, federalism implications, employment impacts, and energy impacts resulting from the rule.

[4] Executive Order 12866, Regulatory Planning and Review, October 4, 1993; Executive Order 13563, Improving Regulation and Regulatory Review, January 18, 2011; Office of Management and Budget, Circular A-4, September 17, 2003.

CHAPTER 2. CHARACTERIZATION OF THE REGULATED UNIVERSE

The final rule to update the test methods for the ignitability characteristic determination may potentially affect any laboratory that currently conducts flash point tests using either Method 1010A (Pensky-Martens) or Method 1020B (Setaflash). The rule may also affect any laboratory that conducts tests using any of the methods updated to remove references to mercury thermometers (Method 0010, Method 0011, Method 0020, Method 0023A, or Method 0051).

The analysis of the rule's cost and cost savings impacts (see Chapter 3) estimates incremental costs that will be incurred on a per-facility basis (e.g., training) as well as incremental costs and cost savings that will be incurred on a per-test basis (e.g. labor time to conduct tests). To facilitate the estimation of all such costs and cost savings associated with the final rule, this chapter estimates the number of facilities affected by the final rule and the number of liquid flash tests conducted annually across the universe of facilities. The sections that follow present EPA's derivation of these estimates.

IDENTIFICATION OF FACILITIES AFFECTED BY THE FINAL RULE

The universe of facilities affected by the proposed updates to ignitability test methods and test methods removing the requirement for mercury thermometers includes (1) commercial laboratories, (2) regional EPA laboratories, and (3) state laboratories. To estimate the number of such laboratories, this RIA uses a combination of data from laboratory accreditation organizations and correspondence with the personnel of commercial, EPA, and state laboratories. This section discusses how EPA estimates the number of laboratories in each category that would be affected by the final rule.

EPA anticipates that every facility that currently conducts flash point testing (1) is compliant with the current test methods, (2) will adopt the updated test methods, and (3) will continue to conduct flash point testing. To the degree that facilities are not currently compliant or do not adopt the new method, this analysis may overestimate the number of facilities affected by the rule. Similarly, this RIA does not consider the possibility that facilities that do not currently conduct flash point testing may decide to begin conducting testing under the new method.

COMMERCIAL LABORATORIES

To identify the universe of commercial laboratories that conduct flash point tests of liquids using either Method 1010A or 1020B, or any tests affected by the removal of mercury thermometers, EPA examined labs that are certified or accredited to complete these tests. The NELAC Institute (TNI) is the main national organization which accredits labs in the US.[5] TNI certifies 18 states and other independent organizations as accreditation bodies to accredit labs to the same national standard. This RIA relies on the TNI National Environmental Laboratory Accreditation Management System (LAMS) database as the primary data source to estimate the number of commercial labs currently accredited to conduct either EPA Method 1010A (Pensky-Martens), 1020B (Setaflash), or any of the test methods subject to updates on the use of mercury thermometers.[6]

While the TNI LAMS database should contain all of the accreditations from the individual accreditation bodies, EPA found after reviewing the databases of several state agencies that serve as accreditation bodies that the TNI LAMS database was not a complete repository of all labs certified to conduct either test method. To estimate the universe of potentially affected commercial laboratories, this RIA therefore includes all laboratories certified to conduct either test method under the TNI LAMS database, as well as under each of the accreditation bodies.[7]

In addition to the state accreditation bodies within TNI, EPA reviewed two additional states (California and Washington), which have their own environmental laboratory accreditation programs that are not certified by TNI. While EPA did not review all states not currently covered by TNI, the Agency estimates that the process outlined above captures virtually all commercial labs because each of the state accreditation bodies reviewed accredits labs outside of the state (e.g., Texas accredits laboratories in Louisiana).[8]

Exhibit 2-1 summarizes the results of the process described above. As shown in the exhibit, EPA identified 217 unique commercial laboratories that conduct ignitability testing under either Method 1010 or 1020. EPA identified an additional 18 laboratories accredited to conduct any of the five additional test methods that remove language referencing mercury thermometers under the final rule, for a total of 235 labs affected by the rule. These 235 total laboratories are part of 177 unique firms, including several large commercial laboratories with multiple locations. Of those 235 total laboratories, 83 percent are certified for Method 1010 (Pensky-Martens), six percent are certified to conduct Method 1020 (Setaflash), and three percent are certified for both test methods.

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[5] NELAC formerly stood for the National Environmental Laboratory Accreditation Conference. Database available at: http://lams.nelac-institute.org/.

[6] TNI LAMS includes categories for EPA Method 1010, 1010A, 1020, 1020A, and 1020B. While EPA is only updating the two current method revisions (EPA Method 1010A and 1020B), this analysis includes all laboratories that match any of the respective test method revisions as an estimate of the number of facilities which may conduct ignitability testing using either the Pensky-Martens or the Setaflash test method.

[7] EPA reviewed databases from 14 of the 18 accreditation bodies. When reviewing the state database results, EPA found that some state accreditation bodies only indicated whether a laboratory was accredited to conduct Method 1010 or 1020, without noting the specific method revision (i.e., A or B). EPA included all such instances as part of the universe of potentially affected facilities.

[8] There are currently 13 states that accredit environmental laboratories under the TNI standard.

EXHIBIT 2-1. NUMBER OF COMMERCIAL LABORATORIES ACCREDITED TO CONDUCT TESTING, BY TEST METHOD

TEST METHOD	NUMBER OF LABS ACCREDITED TO CONDUCT TEST	PERCENT OF TOTAL LABS[1]
Flash Point Test Methods		
1010A only (Pensky-Martens)	194	83%
1020B only (Setaflash)	15	6%
Both 1010A and 1020B	**8**	3%
Unique Labs	**217**	92%
Mercury Thermometer Methods		
0010	14	6.0%
0011	11	4.7%
0020	1	0.43%
0023A	14	6.0%
0051	7	3.0%
Unique Labs[2]	**18**	7.7%
Total Unique Labs	**235**	100%
Total Unique Firms	**177**	N/A

Notes:
1. Percent of total labs accredited to conduct each test method; percentages do not sum to 100% because some laboratories are accredited to conduct multiple test methods.
2. The values for the specific test methods do not sum to the total number of unique labs because some laboratories are accredited for more than one test method.

EPA LABORATORIES

Through direct communication with EPA personnel in each Region, EPA determined that labs in eight of the ten Regions are currently able to conduct flash point tests of liquid hazardous wastes using either EPA Method 1010A or 1020B, as shown in Exhibit 2-2. In addition, EPA's National Enforcement Investigations Center (NEIC) also conducts ignitability testing.

EXHIBIT 2-2. EPA LABS CONDUCTING FLASH POINT TESTS

EPA REGION	1010A (PENSKY-MARTENS)	1020B (SETAFLASH)	IGNITABILITY METHOD NOT SPECIFIED[1]	NO IGNITABILITY TEST CAPABILITIES
NEIC	X	X		
Region 1		X		
Region 2			X	
Region 3	X			
Region 4			X	
Region 5		X		
Region 6		X		
Region 7		X		
Region 8				X
Region 9				X
Region 10		X		

Notes:

1. EPA did not receive direct confirmation about the specific ignitability test method used at Regions 2 or 4, but both regions are listed to have the capability on EPA's web site.

STATE LABORATORIES

EPA estimates that many states have analytical laboratories to support inspections undertaken as part of delegated RCRA enforcement authority. To determine how many state laboratories conduct flash point tests under the current test methods, EPA used a combination of several data sources. First, EPA searched the same laboratory accreditation organizations described above to determine if any state laboratories were accredited to perform either test method. This search yielded only one state laboratory (Pennsylvania). EPA also corresponded with four states (North Carolina, Florida, Mississippi, and Maryland) and determined that one additional state (Florida) conducts ignitability testing at a state laboratory. From this small sample, EPA estimates that 40 percent of all states have labs that conduct ignitability testing and would be affected by the final rule. EPA applies this percentage to all states to estimate that 20 state laboratories conduct flash point testing.

EPA's estimate of the total number of laboratories that would be affected by the final rule is presented in Exhibit 2-3, arranged by test method. EPA apportions commercial laboratories between the two test methods by assigning half of the eight commercial labs that are certified for both test methods into each method. For EPA regional labs and state labs, EPA uses the distribution of EPA regional labs by test method (21 percent use the Pensky-Martens method, per Exhibit 2-2 above).

EXHIBIT 2-3. SUMMARY OF LABORATORIES AFFECTED BY FLASH POINT TEST METHOD UPDATES

LABORATORY TYPE	NUMBER OF LABORATORIES		
	PENSKY-MARTENS	SETAFLASH	TOTAL
Commercial	198	19	217
EPA	2	7	9
State	4	16	20
Total	**204**	**42**	**246**

NUMBER OF FLASH POINT TESTS CONDUCTED ANNUALLY

This RIA uses two approaches to estimate the number of flash point tests performed annually using either Method 1010A or Method 1020B. Both approaches account for the two groups of laboratories which conduct ignitability testing: government labs and commercial labs. Both methods also account for two main sources of ignitability testing: (1) tests conducted on behalf of hazardous waste generators to characterize new potentially ignitable waste streams and (2) tests ordered by government enforcement or compliance staff.

APPROACH A: EXTRAPOLATION OF DATA COLLECTED FROM INTERVIEWS WITH LABORATORIES

Under the first approach for determining the number of flash point tests conducted annually, EPA separately estimates the number of tests conducted by commercial labs and government labs based on (1) correspondence with a sample from each category of laboratories, and (2) extrapolation from this sample to the remaining facilities.

To estimate the total number of tests conducted by commercial laboratories, EPA extrapolates annual test numbers from commercial laboratories to the entire commercial laboratory universe based on estimated market size. According to correspondence with one of the major commercial laboratories, their lab conducts approximately 260 flash point tests annually, which represents less than one percent of the total testing market.[9] This translates to 26,000 tests conducted by commercial labs per year.

To assess the annual number of tests conducted by EPA labs, this RIA relies on annual testing data obtained from five out of the eight regional EPA laboratories that conduct flash point testing. For these regions, this RIA calculates a weighted average number of flash point tests per generator, under the assumption that the number of flash point tests is proportional to the total number of generators. The weighted average of tests per generator ranges from 0.0071 to 0.0085, with the low and high end values reflecting the estimated range of generators in each region.[10] This RIA then uses the weighted average

[9] Correspondence with Jim Occhialini at Alpha Analytical on December 1, 2017.

[10] The number of generators in each Region is derived using the same approach described in U.S. EPA, Regulatory Impact Assessment of the Potential Costs, Benefits, and Other Impacts of the Final Hazardous Waste Generator Improvements Rule, September 2016.

to estimate the number of tests conducted in the remaining three regional EPA laboratories (Regions 2, 4, and 6). The estimated number of flash point tests conducted by EPA laboratories on an annual basis is shown in Exhibit 2-4 below.

EXHIBIT 2-4. TESTS CONDUCTED BY EPA LABORATORIES

EPA LABORATORY[1]	NUMBER OF FLASH POINT TESTS PER YEAR[2]	
	LOW	HIGH
NEIC	<100	<100
Region 1	30	30
Region 2	61	61
Region 3	75	75
Region 4	86	98
Region 5	12	12
Region 6	45	46
Region 7	11	11
Region 10	26	26
TOTAL	**~447**	**~460**

Notes:
1. Regions 8 and 9 do not have flash point test capability
2. Values for NEIC and regions 1, 3, 5, 7, and 10 are as reported by Regional lab personnel, with the average presented when a range was provided. Values for other regions are derived using the weighted average described in the main body text.

To develop an estimate of the number of flash point tests conducted by state laboratories, this RIA follows the same process as for EPA regional laboratories. First, as noted above, this RIA estimates that 20 states have analytical laboratories that conduct flash point testing using EPA methods. To estimate the total number of tests conducted by these laboratories, this RIA first estimates the average number of tests per generator for the one state which shared annual test data (Florida). This average value is then multiplied by the number of generators in states assumed to conduct flash point tests, as illustrated in Equation (1). This process results in an estimate of between 133 and 158 flash point tests conducted at State labs each year.

$$(1)\ \ State\ Flash\ Point\ Tests = \frac{Tests}{Generator} \times \frac{Generators}{State} \times States\ with\ Tests$$

Where:

$State\ Flash\ Point\ Tests$ = The total number of flash point tests conducted by state laboratories.

$\frac{Tests}{Generator}$ = The average number of tests conducted by generator based on Florida data (0.0049 tests/generator).

$\frac{Generators}{State}$ = The average number of generators per state (between 1,373 and 1,623 generators/state).[11]

$States\ with\ Tests$ = The number of states that conduct flash point tests (20).

The total numbers of flash point tests conducted in commercial, EPA, and State labs, as estimated through Approach A, are presented in Exhibit 2-5.

EXHIBIT 2-5. TOTAL NUMBER OF ANNUAL FLASH POINT TESTS CONDUCTED ANNUALLY (APPROACH A)

LAB CATEGORY	NUMBER OF ANNUAL TESTS	
	LOW	HIGH
Commercial labs	26,000	26,000
EPA labs	447	460
State labs	133	158
TOTAL	**26,580**	**26,617**

Note: Due to rounding, the numbers presented in exhibits may not add up 100% to the totals provided.

APPROACH B: WASTE STREAM AND INSPECTION ANALYSIS

While Approach A extrapolates anecdotal data from direct correspondence with laboratories to the larger universe, Approach B uses data on the number of waste streams and inspections to estimate the total number of tests conducted as a result of the two main drivers of ignitability testing: (1) hazardous waste characterizations conducted on behalf of generators for the purposes of making a hazardous waste determination and (2) testing ordered by state and EPA compliance or enforcement agencies.

Hazardous Waste Characterizations Ordered by Generators

Under CFR 262.11, each generator of hazardous waste is required to characterize each new waste stream according to the ignitability characteristic. Generators may test each waste stream using either one of the two approved flash point test methods or rely on generator knowledge. Under Approach B, this RIA generates bottom-up estimates of the number of tests conducted by (or for) generators by integrating data on ignitable waste streams from EPA's Biennial Report database with additional information provided by

[11] Number of generators by state is derived using the same approach described in U.S. EPA, Regulatory Impact Assessment of the Potential Costs, Benefits, and Other Impacts of the Final Hazardous Waste Generator Improvements Rule, September 2016. The total number of LQGs and SQGs is used in this analysis because EPA does not anticipate VSQGs to require ignitability testing.

states and the EPA Regions. More specifically, Approach B estimates the number of flash tests conducted by generators based on the following equation:

$$(2) \quad T = (WS_{LI} \times N) \times \frac{1}{P} \times C$$

Where:

$\boldsymbol{T}$ = Total tests conducted annually

$\boldsymbol{WS_{LI}}$ = Total number of liquid waste streams that have been determined to be ignitable (through either testing or generator knowledge).

N = Percent of waste streams which are new in any given year.

P = Percent of tests which are positive, (i.e. result in a flash point below 60 degrees Celsius).

C = Percent of hazardous waste characterizations of ignitability made using testing (as opposed to generator/process knowledge).

Conceptually, Equation 2 was developed in three steps:

1. ***Estimate number of ignitable liquid waste streams in the BR database that are new.*** Because generators are likely to conduct flash tests only for new waste streams that they previously did not generate, the first step in specifying Equation 2 was to develop an expression for the number of ignitable liquid waste streams in the BR database that are ***new*** waste streams. This is represented by the expression ($WS_{LI} \times N$) in Equation 2. Based on input from enforcement and compliance personnel in EPA regions and the states, this RIA estimates that 5-20 percent of all waste streams are new each year (***N***).[12]

   To estimate the total number of liquid waste streams that have been determined to be ignitable ($\boldsymbol{WS_{LI}}$), this RIA uses data from the 2015 Biennial Report (BR) database. The BR requires LQGs to fill out a Waste Generation and Management (GM) form to characterize each waste stream. In some states, SQGs and VSQGs also report on their waste generation. For this analysis, EPA assumes that only LQGs and SQGs would ever send out samples of their waste for testing or analysis. Waste streams were considered to be ignitable liquids if they had a waste code of D001 (ignitable) and any of the following waste form codes: organic liquids, inorganic liquids, organic sludges, and inorganic sludges.[13]

[12] This 5 to 20 percent range from correspondence with state and regional EPA RCRA enforcement personnel. Myles Bartos of Region 3 estimated that 5-10 percent of waste streams are new each year, Alan Annicella of Region 4 estimated that 10-20 percent of waste streams are new each year, and Jenny Patterson of North Carolina estimated that less than 10 percent of waste streams are new each year. Correspondence with Myles Bartos, EPA Region 3, on October 31, 2017. Correspondence with Alan Annicella, EPA Region 4, on November 22, 2017. Correspondence with Jenny Patterson, North Carolina Department of Environmental Quality, on November 27, 2017.

[13] See 2015 Hazardous Waste Report: Instructions and Form.

While every LQG is required to report a GM form and should be captured in the analysis outlined above, many SQGs are not captured in the BR. To estimate the additional liquid, ignitable waste streams generated by these other SQGs, this RIA applies the average number of liquid, ignitable waste streams per SQG from the BR (1.03) to the total estimate of national SQGs, obtained using the same process as described in the regulatory impact analysis for the Generator Standards Final Rule.[14] This process yields an estimate of between 48,949 and 61,884 liquid, ignitable waste streams from SQGs. Combined with the 66,356 liquid, ignitable waste streams reported in the BR for LQGs, this approach provides an estimate of between 115,305 and 128,240 total liquid waste streams from LQGs and SQGs that have been determined to be ignitable. Applying the range of values for *N* specified above, this RIA estimates that approximately 5,766 to 25,647 new ignitable liquid waste streams are generated each year.

2. ***Estimate the number of potentially ignitable new waste streams generated:*** While the estimate generated after step 1 would indicate which hazardous waste streams are new, this estimate does not reflect all *new* waste streams that required an ignitability determination. Many of the new waste streams generated are likely to be determined not to be hazardous. To estimate the number of *all* new waste streams generated, the expression specified in step 1 ($WS_{LI} \times N$) is divided by the estimated percentage of flash tests that return a positive result (*P*). To estimate the value of *P*, this RIA uses 10 years of test data provided by the laboratory operated by Florida's Department of Environmental Protection, which suggest an average positive test result rate of 69 percent.[15]

3. ***Estimate the number of new potentially ignitable waste streams tested.*** Once a generator identifies a new waste stream requiring an ignitability determination, the generator must decide whether to perform a flash test on the waste stream or make a determination based on its own knowledge of the waste stream. In other words, not all of the waste streams estimated following step 2 are tested. To isolate those that are tested, the estimated generated after step 2 is multiplied by the percentage of potentially ignitable waste streams that are tested (*C*). Based on consultations with state and regional EPA RCRA enforcement personnel, this RIA assumes that between 50 and 75 percent of ignitability determinations are made through flash point testing.[16]

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[14] U.S. EPA, Regulatory Impact Assessment of the Potential Costs, Benefits, and Other Impacts of the Final Hazardous Waste Generator Improvements Rule, September 2016. Applying the method described in this document to the 2015 BR data, there are an estimated 47,313 to 59,797 SQGs.

[15] Florida data provided by Glen Perrigan, Florida Department of Environmental Protection, November 29, 2017.

[16] Range estimated from correspondence with state and regional EPA RCRA enforcement personnel. Justin Young of Region 3 estimated that 75 percent of ignitability determinations use flash point testing, Krista Caron of Mississippi estimated that most ignitability determinations use generator knowledge, and Jenny Patterson of North Carolina estimated that 60 percent of ignitability determinations use flash point testing. Correspondence with Justin Young, EPA Region 3, on November 2, 2017. Correspondence with Krista Caron, Mississippi Department of Environmental Quality, on November 28, 2017. Correspondence with Jenny Patterson, North Carolina Department of Environmental Quality, on November 27, 2017.

Applying Equation 2 based on this logic, this RIA estimates that between 4,178 and 27,878, flash point tests are conducted by (or for) generators on an annual basis, as shown in Exhibit 2-6.

Flash Point tests ordered through compliance/enforcement

In addition to tests conducted by generators, flash tests are also conducted as a result of compliance inspections conducted by EPA regions or individual states. As described below, EPA assumes that a portion of these tests are conducted by commercial labs, and a portion are conducted by EPA and State labs.

To determine the number of ignitability tests that result from the inspection process, this RIA takes a two-part approach. EPA first estimates the number of inspections per EPA region and per state and then estimates the proportion of inspections that result in flash point testing. To estimate the number of inspections by region and state, EPA uses the following equation:

$$(3)\quad Inspections_{R/S} = Avg\ Inspections_{R/S}\ \times PerFPTest\ \times PerPubTest$$

Where:

$Inspections_{R/S}$ = The total number of inspections conducted by EPA Regional labs and state labs per year.

$Avg\ Inspections_{R/S}$ = The average number of inspections conducted by EPA regional or State personnel per year.

$PerFPTest$ = The percentage of inspections that result in flash point testing.

$PerPubTest$ = The percentage of flash point tests that are conducted by EPA Regional labs or by state labs.

This RIA uses the ECHO (Enforcement and Compliance History Online) database to estimate the average number of inspections conducted annually by EPA and State RCRA enforcement staff ($AvgInspections_{R/S}$).[17]

To estimate the percentage of inspections that result in flash point testing (PerFPTest), EPA relies on two separate approaches for the low and high bound estimates. For the low-bound estimate, EPA relies on the smallest estimates obtained through correspondence with state and regional EPA personnel (four percent). To estimate the high-bound ratio of tests to inspections, EPA calculates a weighted average ratio of tests conducted by regional EPA labs (for those labs that provided estimates of the average number of tests conducted annually) to the total number of inspections conducted by the same EPA regions (obtained from ECHO). EPA then applies this weighted average to the total number of inspections conducted by EPA and State enforcement to calculate the total number of tests ordered as a result of RCRA enforcement.

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[17] EPA uses total CEIs (Compliance Evaluation Inspections), which are the primary compliance monitoring mechanism. EPA uses the annual average of inspections per year over the last five years of data. ECHO database available at https://echo.epa.gov/, data accessed 12/08/17.

This RIA assumes that EPA Region or state labs will conduct tests that result from inspections if the Region or state has the capability to conduct flash point testing (PerPubTest). If it does not have this capability, this RIA assumes that the Region or state will send waste samples to a commercial lab for testing. Because EPA estimates that 40 percent of state labs conduct flash point testing (as noted above), this RIA assumes that 40 percent of tests ordered from state inspections are completed by State labs, with the remaining tests completed by commercial labs. Similarly, because EPA estimates that 89 percent of EPA inspections (based on ECHO data) occur in EPA regions that conduct flash point testing, the Agency assumes that 89 percent of tests ordered from EPA inspections are completed by EPA labs, with the remaining 11 percent of tests completed by commercial labs.[18]

Exhibit 2-6 displays the total number of flash point tests conducted annually, as estimated using Approach B.

EXHIBIT 2-6. TOTAL NUMBER OF ANNUAL FLASH POINT TESTS CONDUCTED (APPROACH B)

FACILITY TYPE	REASON FOR TEST	ANNUAL NUMBER OF TESTS	
		LOW	HIGH
Commercial labs	Generator-ordered hazardous waste characterization	4,178	27,878
	EPA-ordered tests from RCRA inspections	11	45
	State-ordered tests from RCRA inspections	339	1,417
	SUBTOTAL	**4,528**	**29,340**
EPA labs	EPA-ordered tests from RCRA inspections	88	366
State labs	State-ordered tests from RCRA inspections	226	945
	TOTAL	**4,842**	**30,650**
Note: Due to rounding, the numbers presented in exhibits may not add up 100% to the totals provided.			

As shown in Exhibit 2-7, the total tests estimated using Approach A fall in the range estimated by Approach B. To reflect the uncertainty in these estimates, the assessment of cost (and cost savings) impacts presented in Chapter 3 uses the full range for each category across both approaches, as shown in the highlighted cells in Exhibit 2-7.

[18] This RIA calculates that 89 percent of all CEI inspections conducted by EPA in the last five years occurred at facilities located in Regions that conduct flash point tests (i.e., all Regions except for Region 8 and Region 9, as shown in Exhibit 2-2). Inspection data were obtained from ECHO on 12/08/17.

EXHIBIT 2-7. NUMBER OF FLASH TESTS CONDUCTED BASED ON TWO APPROACHES

LABORATORY TYPE	NUMBER OF ANNUAL TESTS			
	APPROACH A		APPROACH B	
	LOW	HIGH	LOW	HIGH
Commercial	26,000	26,000	**4,528**	**29,340**
EPA	447	**460**	**88**	366
State	**133**	158	226	**945**
Total	**26,580**	**26,617**	**4,842**	**30,650**
Note: Due to rounding, the numbers presented in exhibits may not add up 100% to the totals provided.				

Exhibit 2-8 summarizes the estimated number of laboratories affected by the final rule, as well as the number of ignitability tests conducted by these laboratories each year. Both the number of laboratories and the number of annual tests are presented by test method. To estimate the number of annual tests conducted by test method, EPA assumes that the distribution of tests by method for each laboratory type is proportional to the distribution of laboratories by method. In other words, 91 percent of commercial laboratories use the Pensky-Martens method (based on the data in Exhibit 2-1), and the same percentage of ignitability tests conducted at commercial laboratories use the same method.

EXHIBIT 2-8. SUMMARY OF LABORATORY AND ANNUAL TEST ESTIMATES USED IN THIS RIA, BY TEST METHOD

LABORATORY TYPE	NUMBER OF LABORATORIES			NUMBER OF ANNUAL TESTS					
				LOW ESTIMATE			HIGH ESTIMATE		
	1010A	1020B	TOTAL	1010A	1020B	TOTAL	1010A	1020B	TOTAL
Commercial	198	19	217	4,132	396	4,528	26,771	2,569	29,340
EPA	2	7	9	19	69	88	98	361	460
State	4	16	20	29	105	133	202	742	945
Total	204	42	246	4,180	570	4,750	27,071	3,672	30,744

Note:

1. Method 1010A is the current Pensky-Martens test method, and Method 1020B is the current Setaflash test method.
2. Due to rounding, the numbers presented in exhibits may not add up 100% to the totals provided.

CHAPTER 3. METHODOLOGY AND RESULTS

This section describes EPA's methodology for assessing the costs and cost savings of the final rule and presents the Agency's estimates of these impacts. In general terms, this methodology consists of three steps. First, EPA estimated the costs of conducting flash point tests for facilities in the potentially regulated universe in the baseline (no rule) scenario. Next, the Agency estimated the costs to facilities in the potentially regulated universe in the final rule scenario. Finally, EPA estimated the costs and cost savings of the final rule by comparing the estimated costs of conducting ignitability tests under the baseline and final rule scenarios.

BASELINE COSTS

To estimate baseline costs, EPA collected information on the unit costs of conducting ignitability tests under the existing flash point test methods, Method 1010A and Method 1020B. These unit costs were applied to all facilities in the potentially impacted universe.

BASELINE UNIT COSTS

EPA developed baseline unit cost estimates from information collected through correspondence with EPA regional labs, State labs, and commercial labs, as well as information collected from publicly available sources, such as vendors of solvents and certified reference materials (CRM). Costs associated with conducting ignitability tests in the baseline scenario can be split into two categories: per-facility annual costs and per-test costs. Exhibit 3-1 presents the unit costs associated with each of these categories.

EXHIBIT 3-1. BASELINE UNIT COSTS (YEAR 2016$)

COST FEATURE	UNIT COSTS	
	PENSKY-MARTENS (1010A)	SETAFLASH (1020B)
Per-Facility Annual Costs		
Calibration of Mercury Thermometers[1]	$339	$339
Per-Test Costs		
Labor[2]	$44	$44
Solvent for Cleaning the Instrument[3]	$0.65	$0.41
Certified Reference Material (CRM)[4]	$15	$14

Notes:

1. Calibration costs from NIST Calibration Program Calibration Services Users Guide Fee Schedule 2011. Calibration costs for Service ID Number 31010C: Laboratory Thermometers (0 °C to 150 °C).
2. Hourly labor rate of $58.73 from the Bureau of Labor Statistics, adjusted for fringe benefits and overhead. Assumption of 0.75 hours per test based on correspondence with personnel at EPA Regional laboratories.
3. Cost of solvent ($0.04/mL) for Certified ACS Reagent Grade Acetone and Toluene are $216.46 and $132.00 (respectively) for a quantity of 4 liters. Solvents are available at https://fishersci.com. EPA assumes that flash point tests use 15 mL of solvent for a Pensky-Martens test and 9 mL of solvent for a Setaflash test, based on correspondence with personnel at EPA Regional laboratories.
4. Cost of CRM from www.sigmaaldrich.com, www.spectrumchemical.com, and www.vhglabs.com for Pensky-Martens ($1.11/mL for n-decane or n-undecane) and from www.tcichemicals.com and www.sigmaaldrich.com for Setaflash ($3.04/mL for para-xylene). EPA assumes that flash point tests use 13 mL of CRM for Pensky-Martens and 5 mL of CRM for Setaflash, based on correspondence with personnel at EPA Regional laboratories.

Per-Facility Annual Costs

For the baseline scenario, EPA estimates that laboratories conducting flash point ignitability tests under Method 1010A or Method 1020B each own a single mercury-containing thermometer, and would need to have this thermometer calibrated by an external service provider. Based on standard calibration costs obtained from the National Institute of Standards and Technology, EPA estimates that the cost of calibrating a mercury-containing thermometer is approximately $339.[19] EPA does not estimate any other per-facility costs for the baseline scenario.

Per-Test Costs

For the baseline scenario, EPA estimates three categories of per-test costs: (1) labor costs for conducting ignitability tests, (2) the cost of the solvent used to clean the flash point test instrument, and (3) costs to purchase CRM used to verify the accuracy of the instrument before testing each sample. For labor costs, EPA uses an hourly wage rate of $31.52 for chemists and materials scientists, derived from the Bureau of Labor

[19] NIST Calibration Program Calibration Services Users Guide Fee Schedule 2011. Calibration costs for Service ID Number 31010C: Laboratory Thermometers (0 °C to 150 °C). 2011 was the last year NIST calibrated mercury thermometers, so this cost is used as a proxy for calibration services performed by a different organization.

Statistics.[20] After applying a multiplier of 1.39 for fringe benefits and a multiplier of 1.336 for overhead, EPA obtained a fully loaded hourly labor rate of $58.73.[21] In addition, EPA assumes that each test takes approximately 0.75 hours to complete in the baseline scenario, based on correspondence with personnel at EPA Regional laboratories, and based on an assumption that all laboratories conducting ignitability tests in the baseline scenario are using manual flash point test instruments.[22] For solvent costs, EPA uses the average cost per mL of acetone and toluene ($0.04/mL), obtained from an online retailer of these two products.[23] EPA assumes that each test requires the use of approximately 15 mL of solvent for a Pensky-Martens test and about 9 mL of solvent for a Setaflash test, based on correspondence with personnel at EPA Regional laboratories and at commercial laboratories.[24] For CRM costs, EPA uses the average cost per mL of several different reference materials, including n-decane and n-undecane for the Pensky-Martens method ($1.11/mL), and para-xylene for the Setaflash method ($3.04/mL).[25] EPA also assumes that each test consumes about 13 mL of CRM for the Pensky-Martens method and about 5 mL of CRM for the Setaflash method, based on correspondence with personnel at EPA Regional laboratories.[26]

ESTIMATION OF TOTAL BASELINE COSTS

To calculate the total costs of conducting ignitability tests in the baseline scenario, EPA calculates total per-facility costs as well as total per-test costs. For per-facility costs, EPA multiplies per-facility annual unit costs by the total number of commercial, EPA, and State laboratories conducting ignitability tests. For per-test costs, EPA multiplies per-test costs by the total number of ignitability tests conducted at each type of lab. Because some costs depend on the specific method used (Method 1010A or Method 1020B), EPA

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[20] Hourly mean wages derived from May 2016 National Industry-Specific Occupational Employment and Wage Estimates for NAICS 543180: Testing laboratories, accessed at https://www.bls.gov/oes/current/oes_nat.htm on December 5, 2017.

[21] Fringe benefit cost factor calculated from Bureau of Labor Statistics, Employer Costs for Worker Compensation, released June 9, 2017. Table 10: Employer Costs per Hour Worked for Employee Compensation and Costs as a Percent of Total Compensation: Private Workers, by Industry Group, March 2017. Overhead loading factor calculated from Remedial Action Cost Engineering and Requirements (RACER) cost estimating software 2005 defaults.

[22] Correspondence with Aaron Zimmer, EPA Region 1, December 11, 2017. Correspondence with Jennie Gundersen, EPA Region 3, October 2, 2017. Correspondence with Colin Breslin and Francis Awanya, EPA Region 5, October 2, 2017. Correspondence with Theresa McBride, EPA Region 10, October 30, 2017. Correspondence with Alyssa Malcolm, EPA, December 18, 2017.

[23] Both draft Method 1010B and 1020C list Acetone and Toluene as common cleaning solvents. Standard Operating Procedures (SOP) for the current test method obtained from Region 3 also list Acetone and Toluene as appropriate solvents. Prices for Certified ACS Reagent Grade Acetone and Toluene are $216.46 and $132.00 (respectively) for a quantity of 4 liters. Solvent prices were obtained from https://fishersci.com on December 5, 2017.

[24] Correspondence with Aaron Zimmer, EPA Region 1, December 11, 2017. Correspondence with Jennie Gundersen, EPA Region 3, October 2, 2017. Correspondence with Howard Holmes, ALS Kelso, December 5, 2017.

[25] Prices for n-decane and n-undecane were obtained from www.sigmaaldrich.com, www.spectrumchemical.com, and www.vhglabs.com on December 5, 2017. Prices for para-xylene were obtained from www.vhglabs.com on December 5, 2017.

[26] Correspondence with Aaron Zimmer, EPA Region 1, December 11, 2017. Correspondence with Jennie Gundersen, EPA Region 3, October 2, 2017. Correspondence with Colin Breslin and Francis Awanya, EPA Region 5, October 2, 2017. Correspondence with Theresa McBride, EPA Region 10, October 30, 2017.

first estimated the number of laboratories running each test method, as well as the number of tests conducted per year using each method. These estimates are presented above in Exhibit 2-8. For the estimated number of ignitability tests conducted each year, Exhibit 2-8 presents the low and high values for each laboratory type (commercial, EPA, and State) estimated using the two approaches described in the previous chapter.

To calculate baseline costs associated with thermometer calibration at the 18 commercial laboratories accredited to conduct the five additional test methods that remove language referencing mercury thermometers under the final rule, EPA multiplies the cost of annual mercury thermometer calibration by 18.

BASELINE COST RESULTS – IGNITABILITY TEST METHODS

Exhibit 3-2 summarizes total estimated baseline annual costs by laboratory type. The exhibit shows total annual costs for thermometer calibration as well as both low and high estimates of total test-related annual costs.

EXHIBIT 3-2. BASELINE COST RESULTS (YEAR 2016$)

LABORATORY TYPE	ANNUAL COSTS FOR THERMOMETER CALIBRATION	TOTAL TEST-RELATED ANNUAL COSTS		TOTAL ANNUAL COSTS	
		LOW ESTIMATE	HIGH ESTIMATE	LOW ESTIMATE	HIGH ESTIMATE
Commercial	$73,500	$270,000	$1,750,000	$344,000	$1,820,000
EPA	$3,050	$5,180	$27,200	$8,230	$30,300
State	$6,770	$7,900	$55,900	$14,700	$62,700
Total	**$89,400**	**$283,000**	**$1,830,000**	**$366,000**	**$1,920,000**

Note: Due to rounding, the numbers presented in exhibits may not add up 100% to the totals provided.

BASELINE COST RESULTS – TEST METHODS WITH MERCURY THERMOMETER LANGUAGE

For the 18 commercial laboratories accredited to conduct other tests for which EPA standards currently reference mercury thermometers, EPA estimates that the baseline costs associated with thermometer calibration would be $6,010.

FINAL RULE COSTS

To estimate costs for the final rule scenario, EPA collected information on unit costs relevant to changes that would result at laboratories that adopted one of the new test methods.

FINAL RULE UNIT COSTS

For the final rule scenario, EPA developed unit cost estimates from information gathered through correspondence with laboratory personnel, as well as from information collected from publicly available sources. EPA divides costs associated with conducting ignitability tests under the final rule scenario into three categories: (1) per-facility one-time costs, (2) per-facility annual costs, and (3) per-test costs. Exhibit 3-3 presents the unit costs for each of these categories.

EXHIBIT 3-3. FINAL RULE UNIT COSTS (YEAR 2016$)

COST ELEMENT	UNIT COSTS	
	PENSKY-MARTENS (1010B)	SETAFLASH (1020C)
Per-Facility One-Time Costs		
Purchasing a New Instrument[1]	$17,829	$4,999
Demonstration of Capability and Drafting SOP[2]	$1,498	$1,498
Training[3]	$1,321	$1,321
Purchasing a new Thermometer[4]	$814	$814
Disposing old Mercury-Containing Thermometers[5]	$11	$11
Per-Facility Ongoing (Annual) Costs		
Calibrating new Thermometers[6]	$225	$225
Per-Test Costs		
Labor[7]	$30	$30
Solvent for Cleaning the Instrument[8]	$0.65	$0.41
Certified Reference Material (CRM)[9]	$15	$5

Notes:

1. Instrument purchase costs from http://products.thomassci.com for Pensky-Martens and from www.elcometerusa.com for Setaflash.
2. Hourly labor rate of $58.73 from the Bureau of Labor Statistics, adjusted for fringe benefits and overhead. Assumption of 25.5 hours of technician time from correspondence with personnel at EPA Regional laboratories.
3. Hourly labor rate of $58.73 from the Bureau of Labor Statistics, adjusted for fringe benefits and overhead. Assumption of 22.5 hours of technician time from correspondence with personnel at EPA Regional laboratories.
4. Cost of an ASTM certified/calibrated organic liquid-in-glass thermometer from "A Guide for Federal Agencies on Replacing Mercury-Containing Non-Fever Thermometers", US EPA (2013).
5. Cost of disposing mercury thermometers from www.lamprecycling.com ($145 per 13 lbs). EPA assumes that each mercury-containing thermometer weights one pound.
6. Calibration costs from National Institute of Standards and Technology Fees 2017, average fees for organic liquid-in-glass thermometers and industrial platinum resistance thermometers, thermistor thermometers, digital thermometers, and other types of thermometers.
7. Hourly labor rate of $58.73 from the Bureau of Labor Statistics, adjusted for fringe benefits and overhead. Assumption of 0.5 hours per test based on correspondence with personnel at EPA Regional laboratories.
8. Cost of solvent ($0.04/mL) for Certified ACS Reagent Grade Acetone and Toluene are $216.46 and $132.00 (respectively) for a quantity of 4 liters. Solvents are available at https://fishersci.com. EPA assumes that flash point tests use 15 mL of solvent for a Pensky-Martens test and 9 mL of solvent for a Setaflash test, based on correspondence with personnel at EPA Regional laboratories.
9. Cost of CRM from www.sigmaaldrich.com, www.spectrumchemical.com, and www.vhglabs.com for both Pensky-Martens and Setaflash ($1.11/mL for n-decane or n-undecane) and from www.tcichemicals.com. EPA assumes that flash point tests use 13 mL of CRM for Pensky-Martens and 5 mL of CRM for Setaflash, based on correspondence with personnel at EPA Regional laboratories.

Per-Facility One-Time Costs

EPA estimates several different types of one-time costs that would be applied at the facility level to a portion of laboratories adopting one of the new test methods. First, laboratories adopting a new test method may purchase a new, automated Pensky-Martens or Setaflash instrument. Such instruments allow for automated temperature ramping, which can significantly decrease the time needed to test each sample. Unit cost estimates for these instruments, obtained from websites of commercial retailers, are provided in Exhibit 3-3.[27] Second, EPA assumes that all laboratories adopting one of the new test methods would need to perform a demonstration of capability (DOC) for the new test method, which would involve testing, initial data collection using the new method, and drafting standard operating procedures. Third, related to the DOC, laboratories would need to train personnel in application of the new method. Based on correspondence with laboratory personnel at EPA regional labs and at commercial labs,[28] EPA estimates that developing the DOC and training staff would each require approximately 22.5 hours of technician time. To value this time, EPA uses the same hourly rate for chemists and materials scientists described above. Finally, EPA assumes that some laboratories adopting one of the new test methods, as well as some laboratories certified to use one of the other test methods that require use of mercury-containing thermometers, would purchase new thermometers and dispose of old mercury-containing thermometers. EPA obtained unit costs of purchasing new thermometers from a recent EPA report and unit costs of disposing of mercury-containing thermometers from commercial vendors.[29]

Per-Facility Ongoing Costs

In the final rule scenario, EPA assumes that those laboratories that replace mercury-containing thermometers would incur costs to calibrate non-mercury-containing thermometers. To represent these costs, EPA uses average calibration costs for organic liquid-in-glass thermometers and special tests of industrial platinum resistance thermometers, thermistor thermometers, digital thermometers, and other types of thermometers, as reported by the National Institute of Standards and Technology. This cost, estimated to be $225 per year, is shown in Exhibit 3-3.

Per-Test Costs

As with the baseline scenario, EPA estimates three categories of per-test costs for the final rule scenario: (1) labor costs for conducting ignitability tests, (2) costs to purchase solvent used to clean the flash point test instrument, and (3) costs to purchase CRM. To estimate the labor time required to conduct a test with one of the proposed test methods,

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[27] Instrument purchase costs from http://products.thomassci.com for Pensky-Martens and from www.elcometerusa.com for Setaflash.

[28] Correspondence with Aaron Zimmer, EPA Region 1, December 11, 2017. Correspondence with Jennie Gundersen, EPA Region 3, October 2, 2017. Correspondence with Howard Holmes, ALS Kelso, December 5, 2017.

[29] Cost of disposing mercury thermometers were obtained from www.lamprecycling.com ($145 per 13 lbs). This RIA assumes that each mercury-containing thermometer weighs one pound. Cost of non-mercury thermometers is obtained from "A Guide for Federal Agencies on Replacing Mercury-Containing Non-Fever Thermometers" (2013) as the cost of an ASTM Certified/Calibrated organic liquid-in-glass thermometer. Costs compiled from thermometers available for purchase from www.gsaadvantage.gov.

EPA assumes that laboratories would be able to use an automated instrument capable of ramping its temperature twice as quickly as is possible with the baseline test but that laboratories would no longer be able to conduct a flash/ no-flash test. Based on these assumptions, EPA estimates that the new test methods would take approximately 0.5 hours to complete per test, or 0.25 hours less than the baseline tests.[30] EPA uses the same per-hour labor costs as in the baseline scenario to monetize this labor time. Accordingly, EPA estimates that the labor costs of conducting each flash point test would be approximately $30 per test. As shown in Exhibit 3-3, EPA estimates that per-test solvent costs would be the same under the final rule scenario as in the baseline scenario. Finally, because the new Setaflash test method would replace the use of para-xylene as a CRM (estimated average cost of $3.04/mL) with the ability to use one of several alternative reference materials (estimated average cost of $1.11/mL), EPA estimates that CRM costs for the Setaflash method would decrease from $14 per test to about $5 per test for the Setaflash method.[31]

FINAL RULE COST ESTIMATE METHODOLOGY

As noted in the introduction to this document, the final rule will allow laboratories to use either the existing test methods (1010A and 1020B) or the new test methods (1010B and 1020C). Because the rule allows for flexibility in the choice of test methods, how different types of laboratories will respond to the availability of new test methods is uncertain. For purposes of this analysis, EPA assumes the following:

- All State, Regional EPA, and commercial laboratories will adopt the new test methods for whatever test method they are currently using.
- Those laboratories that currently use Method 1010A (Pensky-Martens) will adopt Method 1010B, and those that currently use Method 1020B (Setaflash) will adopt Method 1020C.

This RIA presents two alternative approaches, reflecting different assumptions about how commercial laboratories might respond to the final rule, in Appendix A.

For the Final Rule scenario, EPA's analysis makes the following additional assumptions:

- All laboratories that adopt one of the new test methods are assumed to use an automated instrument. EPA Regional and State laboratories that do not already have automated test instruments (either Pensky-Martens or Setaflash instruments) would purchase new instruments. Commercial laboratories are assumed to already have automated test instruments for use under non-EPA test methods.
- All automated test instruments come with a non-mercury thermometer or thermocouple. In addition, as noted above, EPA assumes that all laboratories

[30] Correspondence with personnel at EPA Regional laboratories indicated that determining a finite flash point test takes about one hour per sample. Multiplying this estimate by 50 percent (to account for the faster temperature ramping of automated instruments) yields an estimate of 0.5 hours per sample.

[31] EPA assumes that the quantity of CRM used for Setaflash tests under the updated method would be the same as that used under the current method.

opting to switch to the updated ignitability tests either have an automated test instrument already (in the case of commercial laboratories and some State and EPA laboratories) or will obtain an automated test instrument equipped with a non-mercury thermometer. Therefore, the only laboratories that would need to purchase a non-mercury thermometer are the 18 commercial laboratories that are accredited to conduct the five additional test methods for which the final rule will remove language requiring mercury thermometers.[32]

- EPA assumes that only laboratories that purchase a non-mercury thermometer (i.e., the 18 commercial laboratories mentioned above) would incur costs to have those thermometers calibrated. Correspondence with personnel at EPA Regional laboratories indicates that thermocouples included in automated instruments can be calibrated in-house at minimal cost.[33]

To estimate the total costs of conducting ignitability tests under the final rule scenario, EPA first estimates total one-time costs by multiplying per-facility one-time costs by the number of laboratories assumed to incur each cost feature (purchasing a new instrument, training, purchasing a new non-mercury thermometer, etc.). EPA then estimates total annual costs by multiplying per-facility annual costs by the number of laboratories assumed to incur that cost feature (calibrating new non-mercury thermometers). Finally, EPA estimates total annual test-related costs by multiplying per-test costs by the number of tests conducted with each test method per year.

FINAL RULE COST RESULTS

Exhibits 3-4, 3-5, and 3-6 summarize the total estimated costs by laboratory type for the final rule scenario. Exhibit 3-4 presents total estimated costs associated with changes to ignitability test methods, Exhibit 3-5 presents total estimated costs associated with changes to test methods with language referencing mercury-containing thermometers, and Exhibit 3-6 presents total estimated costs for all changes. The exhibits show total one-time costs as well as both low and high estimates of total annual costs.

[32] The five test methods for which the proposed rule will remove language requiring mercury-containing thermometers are Method 0010, Method 0011, Method 0020, Method 0023A, and Method 0051. As discussed in Chapter 2, the RIA estimates that 18 commercial laboratories are accredited to conduct these five test methods and are not among the laboratories accredited to conduct flash point tests using Method 1010A or Method 1020B.

[33] Correspondence with Ernest Waterman, EPA Region 1, November 29, 2017.

EXHIBIT 3-4. FINAL RULE IGNITABILITY TEST COST RESULTS (YEAR 2016$)

LABORATORY TYPE	TOTAL ONE-TIME COSTS	TOTAL ANNUAL COSTS	
		LOW ESTIMATE	HIGH ESTIMATE
Commercial	$614,000	$202,000	$1,310,000
EPA	$67,100	$3,420	$18,000
State	$149,000	$5,210	$36,900
Total	**$830,000**	**$210,000**	**$1,360,000**
Note: Due to rounding, the numbers presented in exhibits may not add up 100% to the totals provided.			

EXHIBIT 3-5. FINAL RULE MERCURY THERMOMETER TEST METHOD COST RESULTS (YEAR 2016$)

LABORATORY TYPE	TOTAL ONE-TIME COSTS	TOTAL ANNUAL COSTS
Commercial	$14,800	$4,040
EPA	$0	$0
State	$0	$0
Total	**$14,800**	**$4,040**

EXHIBIT 3-6. FINAL RULE COST RESULTS (YEAR 2016$)

LABORATORY TYPE	TOTAL ONE-TIME COSTS	ANNUAL COSTS				
		TOTAL PER-FACILITY ANNUAL COSTS	TOTAL TEST-RELATED ANNUAL COSTS		TOTAL ANNUAL COSTS	
			LOW ESTIMATE	HIGH ESTIMATE	LOW ESTIMATE	HIGH ESTIMATE
Commercial	$629,000	$4,040	$202,000	$1,310,000	$206,000	$1,310,000
EPA	$67,100	$0	$3,420	$18,000	$3,420	$18,000
State	$149,000	$0	$5,210	$36,900	$5,210	$36,900
Total	**$845,000**	**$4,040**	**$210,000**	**$1,360,000**	**$214,000**	**$1,370,000**
Note: Due to rounding, the numbers presented in exhibits may not add up 100% to the totals provided.						

NET COST IMPACTS

EPA estimates the net cost impacts of the proposed changes to ignitability test methods by subtracting ignitability testing costs in the baseline scenario from ignitability testing costs in the final rule scenario. Doing so results in total one-time costs of $830,000 and annual cost savings of between $156,000 and $555,000. For the net cost impacts of proposed changes to mercury thermometer test methods, EPA estimates total one-time costs of $14,800 and annual cost savings of $2,050. To estimate the total combined net cost impacts of both one-time costs and annual costs, EPA estimates the net present value of these cost impacts over a 20-year period, using both three and seven percent discount rates. These estimates are presented in Exhibit 3-7 for ignitability test method changes, in Exhibit 3-8 for mercury thermometer test methods, and in Exhibit 3-9 for the final rule as a whole. As Exhibit 3-7 shows, the proposed changes to ignitability test methods are expected to reduce the net present value of costs over 20 years by between $1.49 and $7.43 million using a three percent discount rate and by between $0.82 and $5.05 million using a seven percent discount rate. As shown in Exhibit 3-8, the proposed changes to mercury thermometer test methods are expected to reduce the net present value of costs over 20 years by $15,700 using a three percent discount rate and by $6,920 using a seven percent discount rate. Exhibits 3-10, 3-11, and 3-12 present annualized cost impacts of the proposed changes to ignitability test methods and mercury thermometer test methods, also using three percent and seven percent discount rates.

EXHIBIT 3-7. NET PRESENT VALUE COST IMPACTS OF THE PROPOSED CHANGES TO IGNITABILITY TEST METHODS OVER 20 YEARS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($7,080,000) - ($1,500,000)	($4,860,000) – ($890,000)
EPA	($116,000) – ($4,460)	($63,200) - $16,100
State	($235,000) - $8,410	($124,000) - $48,900
Total	($7,430,000) – ($1,490,000)	($5,050,000) - ($825,000)

EXHIBIT 3-8. NET PRESENT VALUE COST IMPACTS OF THE PROPOSED CHANGES TO MERCURY THERMOMETER TEST METHODS OVER 20 YEARS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($15,700)	($6,920)
EPA	$0	$0
State	$0	$0
Total	($15,700)	($6,920)

EXHIBIT 3-9. NET PRESENT VALUE COST IMPACTS OF THE PROPOSED RULE OVER 20 YEARS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($7,100,000) - ($1,510,000)	($4,870,000) – ($897,000)
EPA	($116,000) – ($4,460)	($63,200) - $16,100
State	($235,000) - $8,410	($124,000) - $48,900
Total	($7,450,000) – ($1,510,000)	($5,060,000) - ($832,000)

EXHIBIT 3-10. ANNUALIZED COST IMPACTS OF THE PROPOSED CHANGES TO IGNITABILITY TEST METHODS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($476,000) - ($101,000)	($459,000) – ($84,000)
EPA	($7,790) – ($300)	($5,970) - $1,520
State	($15,800) - $565	($11,700) - $4,620
Total	($499,000) – ($100,000)	($477,000) - ($77,800)

EXHIBIT 3-11. ANNUALIZED COST IMPACTS OF THE PROPOSED CHANGES TO MERCURY THERMOMETER TEST METHODS (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($1,060)	($653)
EPA	$0	$0
State	$0	$0
Total	($1,060)	($653)

EXHIBIT 3-12. ANNUALIZED COST IMPACTS OF THE PROPOSED RULE (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial	($477,000) - ($102,000)	($460,000) – ($84,600)
EPA	($7,790) – ($300)	($5,970) - $1,520
State	($15,800) - $565	($11,700) - $4,620
Total	($500,000) – ($101,000)	($477,000) - ($78,500)

CHAPTER 4. QUALITATIVE BENEFITS ESTIMATION

EPA is proposing to remove language requiring the use of mercury-containing thermometers in part because of the health and environmental risks posed by such thermometers due to the possibility of accidental release of elemental mercury. This chapter briefly discusses the potential environmental and public health benefits that may result from decreased use of mercury-containing thermometers at laboratories certified to run any of the affected test methods (1010A, 1020B, 0010, 0011, 0020, 0023A, and 0051). Because there is significant uncertainty surrounding both the likelihood of mercury releases and the health risks posed by such releases, this discussion is qualitative in nature.

Mercury is a highly toxic, persistent, bioaccumulative metal that can pose risks to human health through a number of pathways. If elemental mercury is released in poorly-ventilated indoor spaces, it can be breathed as a vapor and absorbed through the lungs.[34] If it is released into the environment, it can precipitate from the air into water bodies or land. Mercury that collects in water bodies can then enter the tissues of aquatic organisms, leading to accumulation up the food web and posing a danger to people consuming contaminated fish.[35]

Health impacts of mercury inhalation or ingestion include neurodevelopmental effects, such as tremors, emotional changes, insomnia, neuromuscular changes, headaches, and impaired brain development in children. Mercury exposure may also have cardiovascular impacts, though this remains an area in need of further study, as the specific dose-response functions for these effects are not yet fully understood.[36]

Removing language requiring the use of mercury-containing thermometers from the affected test methods would reduce the likelihood that use of mercury-containing equipment in laboratories could lead to accidental releases of elemental mercury to indoor settings. Assuming that laboratories properly recycle or dispose of mercury-containing thermometers once they are no longer needed for these test methods, the final rule should also reduce the likelihood of elemental mercury being released to the environment.

[34] U.S. EPA. A Guide for Federal Agencies on Replacing Mercury-Containing Non-Fever Thermometers. June 2013.

[35] U.S. EPA. Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards. December 2011.

[36] U.S. EPA. Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards. December 2011.

CHAPTER 5. EQUITY CONSIDERATIONS AND OTHER IMPACTS

As required by applicable statutes and executive orders, this chapter summarizes EPA's analysis of equity considerations and other regulatory concerns associated with the final rule. This chapter assesses potential impacts, with respect to the following issues:

- **Regulatory planning and review**: requires examination and quantification of costs and benefits of regulating with and without the final rule;
- **Regulatory flexibility:** focuses on the potential effects of the final rule on small entities;
- **Employment impacts:** assesses the potential impact of the final rule on employment;
- **Unfunded mandates:** examines the implications of the final rule with respect to unfunded mandates;
- **Federalism:** considers potential issues related to state sovereignty;
- **Tribal governments:** extends the discussion of federal unfunded mandates to include impacts on Native American tribal governments and their communities;
- **Energy Impacts:** examines the impacts of the final rule on energy use, supply, and distribution;
- **Environmental justice:** considers potential issues for minority and low-income populations;
- **Children's health protection:** examines the potential impact of the final rule on the health of children; and
- **Reducing regulations and controlling regulatory costs:** considers the costs of the final rule, net of avoided costs.

REGULATORY PLANNING AND REVIEW

Under Executive Order (EO) 12866 [58 FR 51735 (October 4, 1993)], as amended by Executive Order 13563, the Agency, in conjunction with the Office of Management and Budget's (OMB's) Office of Information and Regulatory Affairs (OIRA), must determine whether a regulatory action is "significant" and therefore subject to OMB review and the full requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity,

competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, as affirmed in Executive Order 13563, the Agency has determined that this final rule is not a significant regulatory action because it does not fall within any of the categories specified above.

Findings for the economic assessment indicate that the rule, as proposed, is projected to result in net annual cost savings. Because these costs are less than $100 million, the final rule is not considered to be an *economically* significant action.

In addition to calling for assessment of regulatory costs, the Executive Order also requires Federal agencies to assess benefits and, "recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs."[37] The benefits of the final rule will include greater flexibility for testing labs to keep up with industry best practices and may also include cost savings for affected laboratories and reduced releases of mercury to the environment.

REGULATORY FLEXIBILITY

The Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), 5 USC 601 et seq., generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute. This analysis must be completed unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions. Based on EPA's RFA/SBREFA analytic guidance, a rule is not expected to result in a significant economic impact for a substantial number of small entities if the costs of the regulation for a facility are less than 1 percent of annual revenues.[38]

To estimate the effect of the final rule on small entities, this RIA first determines whether each affected firm is small, and then considers whether or not the cost impacts estimated represent a significant impact. This RIA uses the 2016 SBA (Small Business Administration) Table of Small Business Size Standards to determine which of the

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[37] See Section 1(b)(6) of Executive Order 12866.

[38] U.S. EPA, Final Guidance for EPA Rulewriters: Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act, November 2006.

commercial laboratories affected by the final rule are considered small. The SBA Size Standards are specific to the industry effected, represented by NAICS codes. The 235 total facilities affected by the final rule represent 177 unique firms. This RIA obtains firm-level revenues (and employment data in some cases) and NAICS code (North American Industry Classification System) for each firm from two online databases: Hoovers and Manta.[39] As shown in Exhibit 5-1 below, out of the 177 unique firms, this RIA identifies NAICS codes and revenue or employment data for 155 firms. 128 out of the 155 firms identified were determined to be small under either SBA revenue or employment size thresholds, representing 82 percent of identified firms and 72 percent of all firms.

EXHIBIT 5-1. SUMMARY OF SMALL ENTITIES POTENTIALLY AFFECTED BY THE PROPOSED RULE

INDUSTRY	NUMBER OF FIRMS	SBA SIZE STANDARD (MILLIONS 2016$ OR EMPLOYMENT)	NUMBER OF SMALL FIRMS	AVERAGE REVENUES OF SMALL FIRMS (MILLIONS)	NUMBER OF SMALL FIRMS WITH COSTS EXCEEDING 1% OF ANNUAL REVENUES
Testing Laboratories	92	$15.00	82	$4.60	0
Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	13	1,000 emp.	12	$5.14	0
Environmental Consulting Services	10	$15.00	8	$4.90	0
Engineering Services	7	$15.00	5	$3.61	0
Hazardous Waste Treatment and Disposal	4	$38.50	2	$10.38	0
All Other Support Services	3	$11.00	3	$1.53	0
Other Electric Power Generation	3	250 emp.	0	N/A	0
Petroleum Refineries	3	1,500 emp.	1	$75.00	0
Other industries	20	Varies	14	$7.89	0
Unidentified	22	N/A	20	$5.54	0
Total	**177**		**147**	**$5.54**	**0**

Notes:
The other industries include 16 other industries each with two laboratories or fewer.
Unidentified firms are assumed to have the average revenue of all small firms.

[39] Hoovers is primarily used to obtain revenue and employment data. If the firm is not identified in Hoovers, this RIA searches on Manta.com, a public database of business information.

For the 20 unidentified firms, this RIA assumes they have the average annual revenue of the firms already determined to be small from the SBA size comparison as a conservative estimate. To determine whether this proposed regulation will have a significant economic impact on these entities, this RIA compares the firm-level revenue to firm-level incremental annualized costs of the final rule. For commercial labs, the analysis presented above in Chapter 3 indicates that the final rule will result in cost savings. Therefore, out of the 128 firms defined as small under the SBA size standards, no firms have costs greater than one percent of annual revenues.

EMPLOYMENT IMPACTS

Executive Order 13777 directs federal agencies to consider a range of issues regarding the characteristics and impacts of regulations, including the effect of regulations on jobs (Executive Order 13777, 2017). Employment impacts of environmental regulations include a mix of potential declines and gains in different sectors of the economy over time. Impacts on employment can vary according to labor market conditions and may differ across occupations, industries, and regions. Isolating employment impacts of regulation is difficult as they are a challenge to disentangle from employment impacts caused by a plethora of ongoing concurrent economic changes.

This RIA considers the employment impacts of the final rule. Ideally, EPA would conduct a quantitative assessment of these impacts, but insufficient data are available to quantify changes in employment associated with the rule. This RIA therefore presents a qualitative assessment of the rule's potential employment impacts.

In the long run, environmental regulation is expected to cause a shift of employment among employers rather than affect the general employment level (Arrow et al. 1996).[40] However, regulation can have transitional employment effects. In general, environmental regulation produces effects that are similar to an increase in demand for environmental quality. Compliance with environmental regulation can result in increased demand for the inputs or factors (including labor) used in the production of environmental protection. However, the regulated sector generally relies on revenues generated by their other market outputs to cover the costs of supplying increased environmental quality. This can lead to reduced demand for labor and other factors of production used to produce the market output. Employment impacts, both positive and negative, in sectors upstream and downstream from the regulated sector, or in sectors producing substitute or complimentary products, may also occur.

EPA estimates that the final rule may result in small changes in the labor time required for flash tests. As described in Chapter 3, the amount of time required per test may

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[40] Arrow, K. J.; M. L. Cropper; G. C. Eads; R. W. Hahn; L. B. Lave; R. G. Noll; Paul R. Portney; M. Russell; R. Schmalensee; V. K. Smith and R. N. Stavins. 1996. "Benefit-Cost Analysis in Environmental, Health, and Safety Regulation: A Statement of Principles." American Enterprise Institute, the Annapolis Center, and Resources for the Future; AEI Press. Available At https://scholar.harvard.edu/files/stavins/files/benefit_cost_analysis_in_environmental.aei_.1996.pdf. Accessed September 25, 2017.

decline from 0.75 hours to 0.5 hours, a decline of 0.25 hours per test. In addition, EPA estimates that additional labor time will be required for one-time activities such as the Demonstration of Capabilities and training of laboratory staff.

UNFUNDED MANDATES

Among its other purposes and federal agency rulemaking requirements, the Unfunded Mandates Reform Act (UMRA) requires federal agencies, unless otherwise prohibited by law, to assess the effects of their regulatory actions on state, local, and tribal governments and on the private sector, to determine whether any final rulemaking may result in "any Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more in any one year."

Section 202 of UMRA requires federal agencies that propose rules that are likely to exceed this expenditure threshold to prepare a "Written Statement" containing the following five components, supply the statement to OMB, and summarize it in the Federal Register notice for the CCR rule:

1. Identification of the applicable authorizing federal law;
2. Qualitative and quantitative assessment of the anticipated costs and benefits of the rule including the costs and benefits to state, local, and tribal governments or the private sector, and an analysis of whether federal resources may be available to pay these costs;
3. Estimates of future compliance costs and any disproportionate budgetary effects;
4. Estimates of effects on the national economy such as productivity, economic growth, employment, job creation, international competitiveness; and
5. Description and summary of agency's prior consultation with elected representatives of the affected state, local and tribal governments.

As indicated above, the final rule is expected to lead to net cost savings. As a result, EPA expects that the rule would not result in annual expenditures exceeding $100 million annually and therefore would not be subject to requirements of Section 202 of UMRA as listed above.

FEDERALISM

The 1999 Federalism Executive Order 13132 furthers the policies of UMRA by establishing federalism principles, federalism policymaking criteria, and a state and local government consultation process for the development of federal regulations with implications for federalism. These include regulations and other federal policies and actions that have substantial direct effects on states, on the relationship between the federal government and the states, or on the distribution of power and responsibilities among the various levels of government.

Pursuant to the consultation process of Executive Order 13132, this section evaluates whether the final rule may "impose substantial direct compliance costs" on state and local governments. EPA's 2008 guidance for compliance with Executive Order 13132 describes two numerical methods for evaluating whether an EPA rule may have federalism implications with respect to "substantial direct compliance costs": [41]

1. ***The $25 million test***. Annualized direct compliance cost expenditures to state and local governments in aggregate of $25 million or more.
2. ***The 1 percent test.*** Annualized direct compliance costs faced by state and local governments are likely to equal or exceed 1 percent of their annual revenues.

This final rule is not expected to have federalism implications. EPA does not anticipate that it will have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in the Order.

While the final rule is not expected to have federalism implications, it may result in a combination of costs and cost savings for individual states. States with laboratories that conduct ignitability testing may adopt one of the new test methods. If they do so, they will likely incur one-time costs to purchase automated test instruments, conduct a Demonstration of Capability, and train staff in following the new test method, though this RIA estimates that they will also realize cost savings from reduced time to conduct tests, and potentially reduced costs for Certified Reference Material.

TRIBAL GOVERNMENTS

Executive Order 13175, entitled "Consultation and Coordination with Indian Tribal Governments" (65 FR 67249, November 9, 2000), requires EPA to develop an accountable process to ensure "meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications." Because the final rule is expected to result in net cost savings, EPA does not expect that it would result in any adverse impacts on tribal entities. Thus, Executive Order 13175 does not apply to this rule.

ENERGY IMPACTS

Executive Order 13211, "Actions Concerning Regulations that Affect Energy Supply, Distribution, or Use" (May 18, 2001), addresses the need for regulators to more fully consider the potential energy impacts of regulatory action. Under this executive order, agencies are required to prepare a Statement of Energy Effects when a regulatory action may have significant adverse effects on energy supply, distribution, or use, including impacts on price and foreign supplies. Additionally, the requirements obligate agencies to consider reasonable alternatives to regulatory actions with adverse effects and the impacts that such alternatives might have on energy supply, distribution, or use.

[41] The two methods are from "EPA's Action Development Process -- Guidance on Executive Order 13132: Federalism," OPEI Regulatory Development Series, Nov 2008, at http://intranet.epa.gov/adplibrary/documents/federalismguide11-00-08.pdf.

The Final Rule does not directly regulate energy production or consumption. In addition, with net annual cost savings, the costs of this final rule are not considered economically significant under Executive Order 12866. As such, the rule is not subject to Executive Order 13211.

ENVIRONMENTAL JUSTICE

Executive Order (EO) 12898 (59 FR 7629, Feb. 16, 1994) directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States. Among other actions, the Order directs agencies to improve research and data collection regarding health and environmental effects in minority and low-income communities. Because the final rule would only change test methods for characterizing hazardous waste, it would not affect how such waste is disposed of. EPA therefore does not expect it to result in any adverse environmental justice impacts.

CHILDREN'S HEALTH PROTECTION

Executive Order 13045, entitled "Protection of Children from Environmental Health Risks and Safety Risks" (62 FR. 19885, April 23, 1997) applies to any rule that: (1) is determined to be "economically significant" as defined under E.O. 12866, or (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

As discussed above, pursuant to the terms of Executive Order 12866, the final rule is not expected to have a significant economic impact, and is not subject to EO 13045.

REDUCING REGULATIONS AND CONTROLLING REGULATORY COSTS

Executive Order 13771 requires an accounting of the net costs or cost reductions of a rulemaking. The annualized net cost impacts of the final rule are net cost savings of between $78,500 and $477,000 (based on a discount rate of 7 percent).

APPENDIX A. ALTERNATIVE APPROACHES FOR ESTIMATING COSTS OF PROPOSED CHANGES TO IGNITABILITY TEST METHODS ON COMMERCIAL LABORATORIES

The cost analysis presented in Chapter 3 employs the assumption that all commercial laboratories will adopt the new test methods for whatever test method they are currently using. However, because the rule allows for flexibility in the choice of test methods, it is not certain that this assumption will hold for all commercial laboratories. Based on the incremental costs of adopting one of the new test methods for each laboratory, commercial laboratories may opt to continue to use the current test methods, rather than adopting a new method. To account for uncertainty in how commercial laboratories will respond to the rule, this appendix presents two alternative approaches designed to provide lower and upper bound estimates of cost impacts:

- **Approach A**: All commercial laboratories currently using the old Pensky-Martens test method (1010A) would switch to the new Setaflash method (1020C). All commercial laboratories currently using the old Setaflash test method (1020B) would adopt the new Setaflash method (1020C). This approach represents the lower-bound estimate of cost impacts, because it assumes that commercial laboratories that switch from the baseline Pensky-Martens test method to the new Setaflash test method would realize significant cost savings from reduced CRM requirements.

- **Approach B**: All commercial laboratories currently using the old Pensky-Martens test method (1010A) would continue to use that method. All commercial laboratories currently using the old Setaflash test method (1020B) would adopt the new Setaflash method (1020C). This approach represents the upper-bound estimate of cost impacts, because it assumes that commercial laboratories that continue to use the old Pensky-Martens test method would not realize cost savings from reduced labor time associated with the use of an automated apparatus.

These two alternative approaches only affect EPA's estimates of costs associated with proposed changes to ignitability test methods. This appendix therefore does not provide updated estimates of the costs of proposed changes to mercury thermometer test methods.

Exhibit A-1 summarizes total estimated costs by laboratory type for each of these two alternative approaches. Net cost impacts of the proposed changes to ignitability test methods under these two alternative approaches are presented in Exhibits A-2 and A-3. As the exhibits show, both Approach A and Approach B result in sizable net cost savings, though Approach A produces an estimate of cost savings that is greater than the savings reported in Chapter 3, while Approach B produces an estimate of cost savings smaller than the savings reported in Chapter 3.

EXHIBIT A-1. FINAL RULE IGNITABILITY COST RESULTS UNDER ALTERNATIVE APPROACHES A AND B (YEAR 2016$)

LABORATORY TYPE	TOTAL ONE-TIME COSTS	TOTAL ANNUAL COSTS	
		LOW ESTIMATE	HIGH ESTIMATE
Commercial (Approach A)	$614,000	$161,000	$1,040,000
Commercial (Approach B)	$53,800	$261,000	$1,690,000
EPA	$67,100	$3,420	$18,000
State	$149,000	$5,210	$36,900
Total (Approach A)	**$830,000**	**$170,000**	**$1,100,000**
Total (Approach B)	**$270,000**	**$269,000**	**$1,740,000**

EXHIBIT A-2. NET PRESENT VALUE COST IMPACTS OF THE PROPOSED CHANGES TO IGNITABILITY TEST METHODS OVER 20 YEARS UNDER ALTERNATIVE APPROACHES A AND B (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial (Approach A)	($11,000,000) - ($2,100,000)	($7,650,000) - ($1,320,000)
Commercial (Approach B)	($934,000) - ($180,000)	($650,000) - ($112,000)
EPA	($116,000) - ($4,460)	($63,200) - $16,100
State	($235,000) - $8,410	($124,000) - $48,900
Total (Approach A)	**($11,300,000) - ($2,100,000)**	**($7,840,000) - ($1,260,000)**
Total (Approach B)	**($1,280,000) - ($176,000)**	**($837,000) - ($47,400)**

EXHIBIT A-3. ANNUALIZED COST IMPACTS OF THE PROPOSED CHANGES TO IGNITABILITY TEST METHODS UNDER ALTERNATIVE APPROACHES A AND B (YEAR 2016$)

LABORATORY TYPE	3% DISCOUNT RATE	7% DISCOUNT RATE
Commercial (Approach A)	($739,000) - ($141,000)	($723,000) - ($125,000)
Commercial (Approach B)	($62,800) - ($12,100)	($61,300) - ($10,600)
EPA	($7,790) - ($300)	($5,970) - $1,520
State	($15,800) - $565	($11,700) - $4,620
Total (Approach A)	**($763,000) - ($141,000)**	**($740,000) - ($118,000)**
Total (Approach B)	**($86,400) - ($11,800)**	**($79,000) - ($4,470)**